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Claims

1. An injection molding apparatus, comprising:

a) a runner component, wherein a melt conduit is defined at least in part by the runner component, wherein the runner component is positionable downstream from a melt source and upstream from a gate into a mold cavity defined in a mold block, wherein the melt conduit has a stagnation zone therein; and

b) a stagnation zone cleaner, wherein the stagnation zone cleaner is moveable through the stagnation zone to urge melt out of the stagnation zone.

2. The injection molding apparatus as defined in claim 1, further comprising a valve pin extending into the melt conduit, wherein the stagnation zone adjoins the valve pin and is shielded by the valve pin.

3. The injection molding apparatus as defined in claim 2, wherein the valve pin is moveable between an open position and a closed position, wherein when in the open position the valve pin is spaced from the gate to permit melt flow into the mold cavity and when in the closed position the valve pin blocks the gate to impede melt flow into the mold cavity, and the injection molding apparatus further comprises a valve pin actuator for moving the valve pin between the open position and the closed position.

4. The injection molding apparatus as defined in claim 1, wherein the stagnation zone is located in a corner portion of the melt conduit.

5. The injection molding apparatus as defined in claim 2, wherein

the melt conduit comprises an upstream portion upstream from the corner portion and extending in a first direction, and a downstream portion downstream from the corner portion and extending in a second direction different from the first direction; and

the valve pin extends in the second direction into the downstream portion.

6. The injection molding apparatus as defined in claim 3, further comprising a stagnation zone cleaner actuator for extending the stagnation zone cleaner in the melt conduit, wherein the stagnation zone cleaner actuator is operable independently of the valve pin actuator.

7. The injection molding apparatus as defined in claim 6, wherein the stagnation zone cleaner actuator comprises a pneumatically actuatable piston for advancing the stagnation zone cleaner into the melt conduit, and a spring for retracting the stagnation zone cleaner from the melt conduit.

8. The injection molding apparatus as defined in claim 6, wherein the stagnation zone cleaner has an actuation surface that is inclined, relative to the direction of melt flow immediately upstream of the stagnation zone cleaner, wherein the actuation surface is configured for receiving a force from an upstream melt flow and transferring the force into a retracting force for the stagnation zone cleaner.

9. The injection molding apparatus as defined in claim 2, wherein the stagnation zone cleaner has an aperture therethrough for slidably receiving the valve pin.

10. The injection molding apparatus as defined in claim 2, wherein the stagnation zone cleaner is slidably engageable with the valve pin.

11. The injection molding apparatus as defined in claim 3, wherein the melt conduit is defined in part in a stationary runner component, in part in a moveable runner component that is positioned downstream from the stationary runner component and in part in a sprue bar assembly between the stationary runner component and the moveable runner component.

12. The injection molding apparatus as defined in claim 1, wherein the stagnation zone cleaner is moveable through the stagnation zone to urge melt out of the stagnation zone downstream.

13. A method of removing melt from a stagnation zone in a melt conduit in an injection molding apparatus, comprising:

(a) providing a stagnation zone cleaner that is moveable through the stagnation zone; and

(b) moving the stagnation zone cleaner through the stagnation zone in a direction that urges melt therein out of the stagnation zone.

14. The method as defined in claim 13, further comprising, after step (b) flushing the melt conduit to remove substantially all of the melt urged from the stagnation zone; and providing a flow of a second melt in the melt conduit subsequent to flushing the melt conduit.

15. The method as defined in claim 14, wherein flushing of the melt conduit is carried out using the second melt.

16. The method as defined in claim 13, wherein step (b) comprises urging the melt to flow downstream from the stagnation zone.

17. The method as defined in claim 16, further comprising initiating melt flow from upstream of the stagnation zone into the low pressure.

18. The method as defined in claim 16, wherein step (b) is carried out by advancing a moveable element through the stagnation zone, and

wherein the method further comprises retracting the moveable element from the stagnation zone, and prior to the retraction step, at least one of the temperature and pressure of melt in the melt conduit proximate the stagnation zone is reduced sufficiently to inhibit melt from filling the stagnation zone during the retraction step.

19. The method as defined in claim 18, wherein after the retraction step, at least one of the temperature and pressure of the melt in the melt conduit proximate the stagnation zone is increased sufficiently to initiate melt flow into the stagnation zone from upstream of the stagnation zone.

20. An injection molding apparatus, comprising:

a) a manifold defining a plurality of runners, wherein the plurality of runners are in fluid communication with a manifold inlet, and wherein each of the runners has an outlet, and wherein the manifold is positionable so that the manifold inlet is downstream from a melt source, and wherein each runner includes a corner portion prior to each outlet, wherein the corner portion is configured to convey the melt through a non-zero angle, wherein each runner includes an outlet portion that extends generally linearly between the corner portion and the outlet;

b) a plurality of nozzles, each nozzle including a nozzle melt channel, wherein each nozzle melt channel is positioned downstream from the outlet portion of one of the runners and upstream from a gate into a mold cavity defined in a mold block;

c) a plurality of gating systems, wherein each gating system includes a valve pin and a valve pin actuator, wherein each valve pin extends into the outlet portion of one of the runners and into the nozzle melt channel of one of the nozzles and wherein the valve pin is movable between an open position wherein the valve pin is spaced from the gate, and a closed position wherein the valve pin prevents melt flow to the mold cavity; and

d) a plurality of stagnation zone cleaners, wherein each stagnation zone cleaner is movable independently of the valve pin, between a retracted position wherein the stagnation zone cleaner is retracted from the

runner, and an advanced position wherein the stagnation zone cleaner extends into a portion of the runner shielded by the valve pin from melt flow upstream from the valve pin.

21. An injection molding apparatus as claimed in claim 20, wherein the corner portion is configured to convey the melt through an angle of approximately 90 degrees.

22. An injection molding apparatus as claimed in claim 20, wherein the stagnation zone cleaner at least partially surrounds the valve pin.

23. An injection molding apparatus as claimed in claim 20, wherein the stagnation includes an aperture therethrough, and wherein the valve pin is slidingly received in the aperture.

24. An injection molding apparatus as claimed in claim 20, wherein the nozzle melt channel extends generally linearly and is positioned in alignment with the outlet portion of one of the runners and upstream from a gate into a mold cavity defined in a mold block.

25. An injection molding apparatus as claimed in claim 20, wherein in the closed position the valve pin cooperates with the gate to prevent melt flow through the gate.